Performance of mark-resight population estimators using two robin populations of known size

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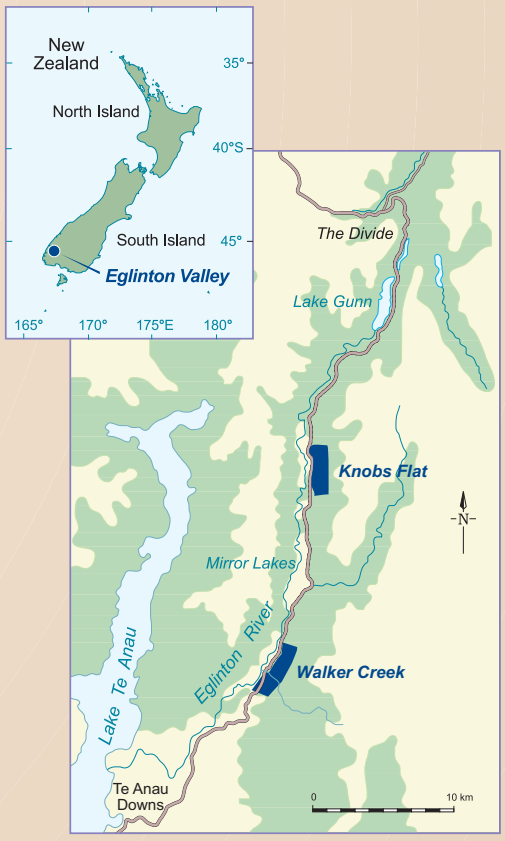
The Department of Conservation is testing and validating different bird monitoring methods as part of the Natural Heritage Management System (NHMS) to improve monitoring consistency and cost effectiveness across the country and to allow accurate measurement of change in response to management actions.

Cost-efficient methods that produce robust estimates of abundance are needed if detailed population trends are to be identified.

A long-term and detailed study examining population responses of various species to management in the Eglinton Valley, Fiordland, makes it an ideal site to test and validate different bird counting methods.

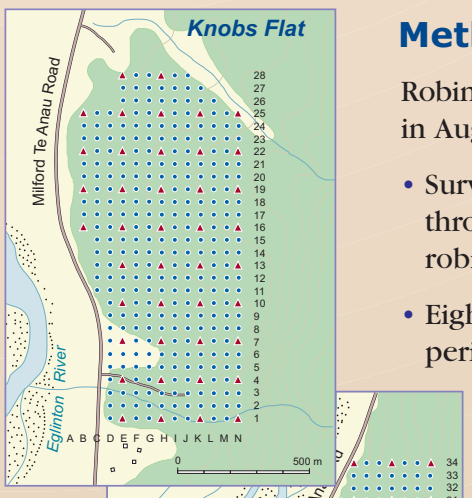
South Island Robins (*Petroica australis australis*) have been identified as a key response species that is easy to monitor and occurs in reasonably good numbers.

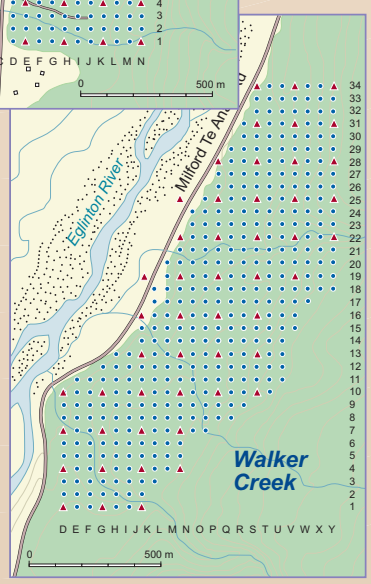
Two 100-ha sites in the Valley—Knobs Flat and Walker Creek—are being intensively monitored for robin productivity. The abundance of robins in these areas is known, and most of the robins are banded. These populations are therefore ideal for assessing other less costly monitoring methods.



Location of study sites.

South Island Robin fledgling. Photo: Greg Coats



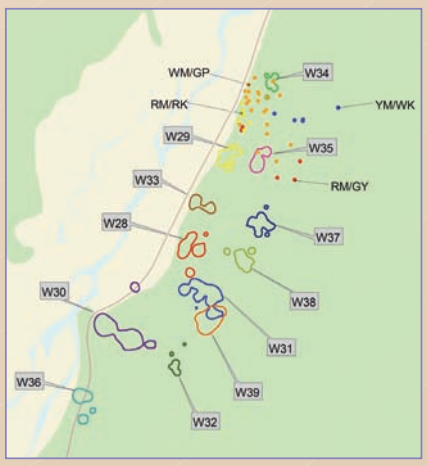


Layout of 50 m and 150 m reference points at study sites.

Methods

Robin populations at Knobs Flat and Walker Creek were surveyed in August (pre breeding) and March (post breeding).

- Surveys involved observers walking slowly and systematically through the area accurately recording all banded and unbanded robins
- Eight sampling occasions were completed within the survey period for each site
- Surveys were completed in the mornings between 0800 h and 1300 h as this is when birds are most conspicuous
- Territory mapping data that enabled us to determine the actual population (*N*) was collected throughout the survey periods



Territory mapping.

Models tested

Two models were tested: the Joint Hypergeometric maximum likelihood Estimator (JHE) and the Bowden's estimator using programme NOREMARK.

Assumptions of the models

JHE estimator

- there is geographic and demographic closure
- no marks are lost
- animals are always correctly identified
- the probability of capture and recapture is the same for all animals
- the probability of sighting all animals is the same within a sampling occasion
- each animal is seen only once within a sampling occasion

Bowden's estimator

This model relaxes some of the above assumptions, i.e. it

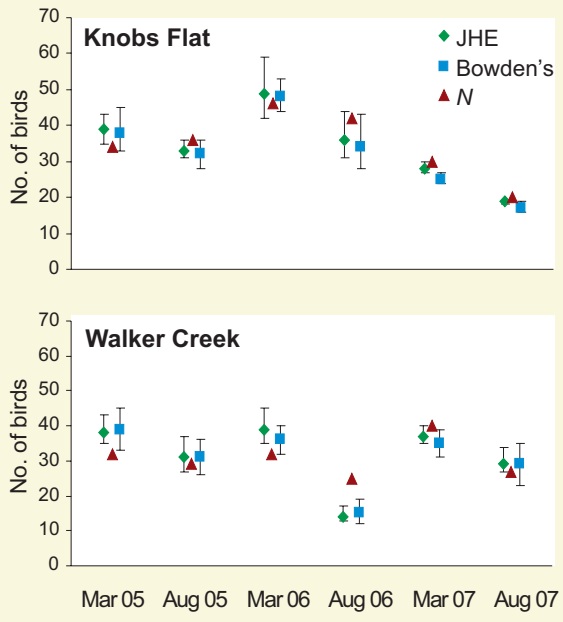
- allows temporary movement out of the study area
- allows variation in sighting probabilities
- does not require all animals to be correctly identifiable

Results

At both survey sites (Walker Creek and Knobs Flat) the 95% confidence interval coverage for the JHE and the Bowden's estimator corresponded well with the actual abundance of robins (determined by territory mapping).

The under-estimates at Walker Creek in August 2006 reflect the fact that robins were already nesting, thus not all the birds were available for sighting.

If the number of banded birds is less than half the actual population, then the confidence intervals will be wide. For this study most of the population was banded, hence the small confidence intervals.



Estimates of robin abundance from March 2005 to August 2007 comparing the JHE and Bowden's estimators with population abundance, N *derived from territory mapping.*

Conclusions and the way forward

So far, use of mark-resight population estimators appears to be a very promising technique that requires considerably less effort compared with territory mapping. There is still one more year of data to collect after this breeding season.

Having a banded population allows monitoring of demographic parameters such as survival, dispersal and recruitment which can be used in population viability models.

Alternative improved models are being evaluated and we hope to test these as they become available.

Acknowledgements

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